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Milan, Italy – July 4, 2000

RE: New U.S. Patent Application in the name of Léon JACCARD and Jean Patrick JACCARD to be filed as a confirmation of PCT/IB99/00001 of January 5, 1999

Agent's docket: 3167/DOB

Hon.
COMMISSIONER OF PATENTS AND TRADEMARKS
BOX PCT
WASHINGTON 20231 D.C. - U.S.A.

Sir,

Applicants desire processing of the above Application based on International Application No. PCT/IB99/00001 of January 5, 1999

This is to enclose:

1) Transmittal letter in duplicate; Authorization to collect US $ 485.°°

2) Small Entity verified Statement;

3) Assignment to GREENPOWER ENGINEERING & TECHNOLOGIES S.A. + Deposit Account Order for assignment fee: US $ 40;

4) Specification and claims with combined declaration and power of attorney duly signed on July 3, 2000 and attached thereto for the above Patent Application;

5) One formal drawing accompanying the specification;

6) Preliminary Amendment with new claims 15 to 28.

We further enclose the following documents:

7) Notification of the International Application Number and of the International Filing Date;

8) Notification concerning submission of Priority Document;

9) Notification of transmittal of the International Search Report or the Declaration
+ International Search Report and cited references;
+ Information Disclosure Statement under 37 CFR 1.97(b);

10) Copy of publication of International Application published under P.C.T.;

11) Notification of receipt of Demand by competent International preliminary Examining Authority;

12) Written Opinion;

13) Applicant's response to the Written Opinion;

14) Notification of transmittal of the International Preliminary Examination Report + International Preliminary Examination Report;

The priority date of the Swiss Patent Application N. 0035/98 of January 9, 1998 is respectfully claimed. The Certified Copy thereof has been submitted February 24, 1999.

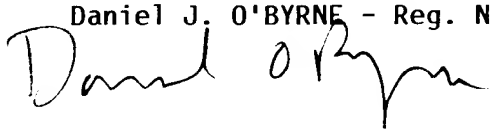
Please place of record in the file the enclosed papers and kindly acknowledge receipt thereof.

Will you please collect immediately the credit specified in the deposit account order, so as to allow the Application to receive an earliest filing date, however within:

JULY 9, 2000.

Respectfully submitted,

Daniel J. O'BYRNE - Reg. N. 36,625



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ing. Carlo Spandonari
ing. Guido Modiano (non res.)

Torino, 11 Feb 2000

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Directorate General 2
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GERMANY

ANTICIPATED BY FAX

Re: PCT Application IB 99/00001
Greenpower Engineering & Technologies S.A. et al.
Preliminary Examination
Your communication of 15 Oct 1999
Our ref.: 3001

Dear Sirs,

This is in reply to your communication above.

That communication substantially acknowledges the novelty of claim 1, but requests that examples be submitted to show that the claimed arrangement indeed solves the stated problem. Such examples, as we understand them, should be reports of tests or measurements made on the gasogen of the invention and on the gasogen of the main reference DE 27 29 764, so that the performances of the two gasogens can be compared and the assumed technical progress be verified.

The applicants have considered how they could go about to provide such examples. However, no feasible way has been found to obtain comparable data, because of the different operating principles of the two gasogens. In fact, the gasogen of DE 27 29 764 and the gasogen of this invention belong to two different, well recognized species, the former being the "counter-current" gasogen, where the rising gas flow crosses the falling fuel fed from above, the latter being the "co-current" gasogen, where the fuel is fed from beneath and rises in the combustion chamber in parallel with the developing gas.

The co-current gasogen has long been recognized as being more efficient than the counter-current gasogen, because the area, or

vertical extension, where a satisfactory reaction can take place is more extended, and the overall efficiency of the gasogen is consequently improved.

The different modes of operation of the two kinds of gasogens give rise to completely different problems also in connection both with the fuel recirculation and the removal of cinders.

In contrast to the solid-bed gasogen of the applicant's invention, it is stated in DE 27 29 764 that the prior gasogen is a fluid-bed gasogen, where the biomass is gasified in a reactor 1, comprising a closed container into which granular coal is fed at some height from the bottom, while oxygen or water is injected into the coal in the lower area of the reactor, through pipes 2 and 3. A mix of carbon dioxide and steam is also injected into the reactor through a further pipe 13, to act as a vehicle for heat and also as a gasification means. Consequently, a fluid coal bed 1a is formed in the bottom part of the reactor, where a considerable proportion of the coal undergoes gasification, while the remaining cinders fall toward the bottom of the cone and into an extraction device (not shown in the drawings of the reference) to be removed through pipes 12.

However, as also stated in DE 27 29 764, the above cinders will contain not only inert matter which has been completely oxidized or is not oxidizable, but also a considerable proportion of uncombusted or partially combusted coal, particularly larger particles which have only been burnt at the surface and still have uncombusted cores. Moreover, a considerable proportion of the partially gasified carbon is entrained into the "whirling layer" (Wirbelschicht) and is pulled away from the fluid bed. In order to improve the gasification of the partially gasified carbon, oxygen-shooting nozzles are arranged around the reactor's periphery.

While it may be true (in a certain sense) that with the gasogen of DE 27 29 764 some kind of fuel recirculation takes place within the combustion chamber itself, because of its whirling state, in fact the degree and mode of recirculation cannot be controlled, and will depend, among other things, also on the nature, size, and uniformity of the fuel.

By contrast, in the applicant's invention, all parameters are held under control. How this control is achieved may be understood if one considers the reaction that takes place in the gasification chamber. Here, the CO_2 emerging from the combustion chamber undergoes the Boudouard reaction:

$$CO_2 + C \; <=> \; 2\,CO - 39 \text{ cal.}$$

During this reaction, each coal chip yielding its surface carbon will be gradually reduced in volume and will eventually become a particle so fine that all the particles together build a bed of flour-like powder. This powder bed becomes more and more impermeable to the passage of the gas that is being generated, and the power of the gasogen will decay progressively.

According to the invention, in order to maintain an adequate granulometry in the gasification chamber, such carbon dust is subjected to an additional passage through the combustion chamber itself by mixing it to the fresh fuel before this is fed to the primary combustion chamber. In the combustion chamber, the recirculated carbon powder will burn first, because of its fine size. Therefore, a majority of the coal entering the gasification chamber will consist of chips having a desirable granulometry.

No such operation takes place in DE 27 29 764.

In our opinion, however, a comparison should be made between the applicant's invention and a prior co-current, solid-bed gasogen: the closest example is EP 565 935. Although the gasogen of this reference also includes some kind of fuel recirculation, this takes place within the combustion chamber itself, and not by mixing the recirculating material to the fresh fuel before this enters the gasogen. Even more important, the gasogen of EP 565 935 does not have a device for separating and withdrawing the solid cinders from the combustion process, so that the cinders will remain in the combustion chamber and contaminate the process with an accumulating effect, which will progressively reduce the efficiency of the gasogen and eventually clog it.

By contrast, the gasogen of the present invention has a cinder separating device (19, 5, 2) for withdrawing the cinders at the most appropriate spot, i.e. at the end of the combustion chamber and before the gasification chamber. Therefore, it will appreciated that the cinders are withdrawn after the combustible matter has had full opportunity to enter the oxidation reaction, but before entering, and consequently contaminating, the area of reduction reaction in the gasification chamber. Accordingly, the cinders that are extracted from the gasogen have only a minimum content of unburnt carbon, and the material that is processed in the gasification chamber comprises a maximum of carbon-based compounds (CO, CO_2) and a minimum of contaminating matter.

The above cinder separation step, performed under controlled conditions, has no precedent in any of the references cited, and is

another feature of the invention which contributes to achieve the desired object.

In our opinion, the above remarks should be sufficient to establish the technical progress of the invention even without submitting examples. We regret that we have been unable to submit such examples as suggested by the Examiner. As stated above, although the applicants were willing, in principle, to comply with the request, it has turned out to be unpracticable to obtain meaningful data which could allow a direct comparison with the prior art.

So that the Examiner may better assess the situation, we wish to point out that the present pilot plant operated by the applicants (which is located near Lugano, Switzerland) and built according to the principles of this invention, is fed mainly with wood chips, and has a thermal rated power of about 200 kW. The synthetic gas produced has a low heating value of 1200 kcal per normal cubic meter, and is used to fuel a marine i.c. engine yielding 55 kW. The plant is operated for periods of several continuous weeks between maintenance stops. As may be expected, the plant is a piece of machinery of considerable size, cost and complexity. The physical structure of the plant is such that it is not easily modifiable (short of rebuilding it), and consequently no way has been found to operate it otherwise than according to the principles of the invention, so that comparisons could be made.

We regret that we were unable to formally comply with the Examiner's requests, but we respectfully ask the Examiner, nevertheless, to reconsider the matter in view of the above explanations.

Very truly yours,

Carlo Spandonari